

## RELIGIOUS BEHAVIOR IN ANIMALS AND MAN: DRUG-INDUCED EFFECTS

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*This paper attempts to develop an experimental analysis of drug-induced religious behavior. The first part discusses drugs and religious behavior in man and includes sections on anthropological, contemporary, and experimental perspectives. The second part reviews analogous natural and drug-induced animal behaviors which are seen to be structurally similar to human religious activities. The functional similarities are examined in the third section which analyses religion in terms of operant behavior concepts and findings. It is concluded that the behavioral, albeit not necessarily the experiential, aspects of drug-induced religious behavior can be studied in the animal model.*

The behavior of organisms is rich in examples of "religious" reactions to the pharmacological agents known as hallucinogens. Mice frequently exhibit head twitches and huddle selectively with other drugged mice in groups that remind a human observer of religious "Shakers." Pigeons adopt a characteristic posture designating fear and submission to what our human observer might describe as surrender, wonder and awe before a supreme being. Elephants shake branches at the moon with what our observer might infer is superstitious reverence. Monkeys adopt a crouched posture with their head on their hands, a posture our human observer finds vaguely reminiscent of Rodin's "Thinker." Chimpanzees display expressions of grief and intense joy. Men adopt similar behavioral postures or utilize verbal and other behaviors to describe their experiences.

Religious experiences with hallucinogens have puzzled and intrigued man for centuries. They have given him "visions" to see, "voices" to listen to, "thoughts" to ponder, and "altered states of consciousness" to explore. They have generated conditions that can only be described by such global and imprecise terms as ecstasy or madness. Some men feel closer to an understanding of themselves. Others feel closer to each other. Some feel a unity with all in their environment. Still others feel one with a universal being and might remark, like Baudelaire (1857:76) in "Poem of Hashish," "It will amaze no one that one last supreme thought comes bursting from the dreamers brain! 'I have become God!'"

But each man finds himself alone. For when man perceives a religious experience he does so alone, in the privacy of his body.

Traditionally, man has attempted to understand drug-induced religious experiences by analysis of overt verbal behaviors. Thus private (covert) experiences can achieve public status and can be subjected to the processes of consensual validation. Descriptive symbols such as words or pictures can be precisely defined, and their controlled use can be shared by others. In a sense, an

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individual's experience can be "felt" by others. However, the task of analyzing such symbolic communication as language is not unlike the problem of analyzing the mouse's head twitches, the pigeon's postures, or the chimpanzee's gestures. All these behaviors involve responses to perceived stimuli in the internal or external environment. Even though there are often no objective stimuli as in the case of "mystical" feelings, we are still dealing with a valid type of inquiry into the behaviors of perceptual systems.

This paper attempts to describe such behaviors and to outline a model for their experimental analysis. The first part discusses the nature of drugs and religion in *Homo sapiens*, with particular emphasis on the nonverbal behaviors. The second part discusses animal behaviors that are analogous to human religious behaviors and the effects that drugs have upon them. The third part outlines a model for the experimental analysis of drug-induced religion in all organisms. The discussion throughout the paper is guided by existing observations and data and is fostered by some speculation and inference. Some allowance for such speculation must be made, since the search for religious behavior in animals may uncover new areas and models for the study of religion in man. Such infrahuman models would have the advantage over others of greater experimental control without the addition of untestable mentalistic constructs.

### DRUGS AND RELIGIOUS BEHAVIOR IN MAN

Man's religion and his religious behavior have been both blessed and plagued by an ancient intimacy with drugs. Behavior is considered religious when it is scrupulously and conscientiously faithful; when it is committed or dedicated to the service of the divine or to that which is of ultimate importance. Religion refers to the practice of these religious beliefs; a personal awareness or conviction of the supreme being or of supernatural powers or influences controlling one's own destiny. Drugs have probably been used in association with religious practices since Paleolithic times, and such use continues today in many Old and New World societies. Nonetheless, the Western church, while faithful that God is there, is nevertheless dubious when anyone sees Him too easily. As Blum (1969:334) notes:

Whether investigating miracles or one-man cosmologists, the conventional religionist, regardless of whether his God is learned through doctrine or felt sublimely, takes a dim view of visions. Yet most intoxicants can produce such states and visions if the user is in tune; witness Henry James on alcoholic joy. The visionary may sense a blessing but the skeptic wonders how often a genie-God is bidden to arise from a pill. The alternative interpretations are two: either the chemical mystic has his own gods—which is heresy and vanity at the least and, though not likely, madness as well—or the powers he has seen are real enough but bear the wrong credentials.

Whether possessed by real gods or madness, the drugged mystic is fair game for an explanatory study because, it will presently be seen, it is difficult to distinguish phenomenologically between these drug-induced religious experiences and non-drug religious experiences (Smith, 1966).

#### Anthropological Origins

The use of hallucinogenic drugs and plants to produce trance states for perceiving and contacting the supernatural world dates back to the very beginnings of *Homo sapiens*. So pervasive have these practices been throughout man's history that Barnard (1963) has even suggested a new field of theo-botany to further explore these relationships. Man's inevitable ecological encounters with plant hallucinogens brought him face to face with "visions and experiences of an overwhelming nature, tending strongly to reinforce his beliefs in the reality of

the supernatural world" (Harner, 1973: xi). This direct confrontation with the supernatural is both a necessary and sufficient proof of religious reality for many hunting and gathering and other non-literate societies. Consequently, it is not surprising that such confrontations are common in the shamanistic practices of these groups. As anthropologist Peter Furst (1972:ix) notes: "the linguistic, archaeological, historical, and ethnographic evidence tends to support the view of some ethnobotanists and anthropologists . . . that the widespread contemporary use of botanical hallucinogens, fermented beverages, and tobacco in New World shamanism does in fact have its remote origins in Old World Paleolithic and Mesolithic shamanism, and that the Paleo-Indian immigrants into North America came culturally predisposed toward a conscious exploration of their new environment for psychotropic plants."

Anthropologists are continually impressed by the emergence of redundant forms in shamanistic confrontations with the supernatural. Confrontations include a variety of behaviors marked by perceptual distortions, spontaneous movements, convulsive gesticulations, singing, dancing, among others. Furst finds that the similarities between the basic premises and motifs of shamanism suggest great antiquity as well as a universal collective unconscious in the human psyche. La Barre (1975) believes that the ubiquity of religious behaviors is simply the human ubiquity of cortical excitation produced by various drug and non-drug states: the process is everywhere humanly identical and there is only cultural variation in symbolic content. A mechanism of action for the production of these behaviors has recently been proposed by Fischer (1975). Accordingly, moderate doses of hallucinogenic substances such as LSD, mescaline, and psilocybin start one experientially moving along a "perception-hallucination" continuum. This movement is marked by increasing states of central nervous system excitation and arousal and these states are cognitively interpreted by Western or Eastern man as normal, creative, hyperphrenic, catatonic, and ecstatic. The latter states of ecstasy include mystical, religious, and rapture experiences. Conversely, some muscle relaxants and tranquilizers can start one experientially moving along a "perception-meditation" continuum wherein there are increasing states of hypoaarousal marked by the emergence of beta, alpha, and then theta EEG waves and these are interpreted as relaxation, *zazen*, *dhārmā*, *dhyan*, and *yoga sāmādhi*.

### Contemporary Usage

Contemporary use of hallucinogenic or psychedelic drugs is often coupled with religious motivations (Deikman, 1967; Houston, 1967) similar to those motivations found in ethnopharmacological confrontations with the supernatural. Such motivations include "desire to discover that which would help to resacralize the objective world. The search for a syncretic vision that would discover a unity and interrelationship between the disparate forms of knowledge. Overcoming the tyranny of time and space. A literal desire to confront God" (Houston, 1967 32).

Prince (1967) has noted that a consequence of such use, particularly among youth, is sociological isolation for varying periods of time. McGlothlin (1967) has compared this phenomena, as exemplified in the hippie use of LSD, to practices of early Christianity whereby sub-cultural groups were also formed. The mystical experiences generated by LSD or natural religious exercises like Christianity are generally viewed as highly personal and hence "socially disruptive." Consequently, "mystics are hard to live with, whether in the Haight-Ashbury, or in monasteries" (Downing, in Smith et al., 1967: 63). McGlothlin relates this phenomenon to the major psychological effect of LSD which is "to temporarily suspend the primacy of habitual perceptions of self, environment, beliefs, and values" (1967: 29). The resultant effects form the cornerstone of the LSD ethic

of "turning on, tuning in, and dropping out." Indeed, an article from the Haight-Ashbury *Oracle* around the peak of the psychedelic revolution of the Sixties outlined the religious meaning of this phase:

To turn on means to find a sacrament which returns you to the temple of God, your own body, to go out of your mind. To tune in means to be reborn; to drop back in, to start a new sequence of behavior that reflects your vision; in other words, to manifest in a behavioral way the religious experience you have had.

in Smith et al., 1967: 48

### Experimentation

There is ample evidence that religious experiences can be expected from ingestion of psychedelic drugs. Leary (1964) stressed the importance of set and setting in programming and guiding drug experiences. Depending on the presence of a spiritual expectation, preparation, and setting, an intense mystical or revelatory experience can be expected in 40% to 90% of subjects ingesting psychedelics. Here Leary is defining religious experience as "the ecstatic, incontrovertibly certain, subjective discovery of answers to four basic questions which concern ultimate power and design, life, man and self" (1964:345). Masters and Houston (1966) review numerous other studies wherein 32% to 75% of the psychedelic subjects reported religious-type experiences if the setting was supportive and 75% to 90%, in a setting providing religious stimuli, reported experiences of a religious and mystical nature.

Clark (1969) has provided the most comprehensive review of drugs and religion to date. Reviewing the experimental evidence, Clark concludes that psychedelic drugs release or trigger religious states of mind and he emphasizes that they do not "cause" them. The strongest single piece of evidence is the classic, albeit infamous, "Good Friday Experiment" conducted by W. N. Pahnke (1964). Briefly, this study involved the controlled administration of psilocybin to theological students who subsequently attended a Good Friday service in a private college chapel. Recorded verbal reports and written reports were obtained from subjects after the service. The reports were judged by pre-defined characteristics of mystical experience and it was found that 90% of the subjects receiving psilocybin experienced mystical consciousness while only 10% of the subjects receiving placebo had similar experiences. Most of the experimental subjects had a "feeling of love and unity and love with mankind." One subject reported to Clark (1969:80) that:

It seemed to me to come the closest to a celebration of the Lord's Supper as I could imagine. . . . Much of my life I have felt alone, but at this moment it seemed as if our fellowship was a clue to the fact that we are never completely abandoned in this life if we truly seek meaningful relationships with other people in a searching sense of sincere responsibility and mutuality.

Siegel examined a number of mystical experiences which occurred during studies on drug-induced visual imagery (Siegel, 1973a; Siegel and Jarvik, 1975). Even though highly trained subjects were used to report their imagery experiences, the mystical reactions were characterized by suppression of verbal reports for periods of up to 10 minutes. These reactions occurred most often with (in order of increasing frequency): amphetamine, marijuana, LSD, mescaline, nitrous oxide, and ketamine. Interestingly, this order is virtually identical to that depicting the degree of central nervous system excitation induced by the same agents. While subjects rarely spoke during the mystical episode itself, reports obtained immediately afterwards usually identified several characteristics including: a rush of

imagery, a white light in the center of the visual field, feelings of dissociation, and mystical feelings as described by Pahnke. In several cases, subjects reacted to their visual imagery experiences with body movements and gestures. At other times subjects would remain catatonic or frozen in bizarre postures. For example, one subject, experiencing a mystical reaction under the influence of nitrous oxide, sat up on the bed, extended his arms to the ceiling, stared fixedly at the wall, and remained in that frozen position for five minutes. During this period, the experimenter was unable to arouse the subject with verbal commands. In the post-drug de-briefing interview, the subject claimed he had a cosmic union with God and the secrets of the universe were revealed to him. In another experiment, a subject under a high dose of LSD suppressed his verbal reporting for 10 minutes. During this period, he laid supine on a bed in the room, stretched his body into a crucifix position, began to cry, then smiled, lifted his head and hands to the ceiling, and remained in a fixed position for several more minutes. Later he reported that he saw a large golden cross descending from the ceiling and it proceeded to merge with his body and carry him off to Heaven. He claimed the experience left a golden aura around his body for several days. During other experiments, it often appeared that subjects manifested mystical or religious reactions almost accidentally. The experiences were difficult to describe and, in an attempt to convey the intensity and novelty of the experience, subjects chose words with large emotional and encompassing connotations. For example, one subject under a high dose of marijuana picked up an ashtray from a nearby table and remarked: "It's so beautiful. The smell, the color pouring over my hand, the sound, the sound it makes! It's difficult to sense where my fingers end and the ashtray begins. It feels like my fingers are melting into the ashtray. It is! It is! My fingers are part of it. It is part of my hand. My hand and the ashtray are one. It's unbelievable. Man should not be allowed to see this for a million years! It's . . . it's . . . it's . . . Omigod! It is God. The ashtray and I are one. We are all one. We are all God! God is all!"

#### DRUGS AND RELIGIOUS BEHAVIOR IN ANIMALS

Religious behavior and ritual was probably in existence 75,000 years ago (Thorpe, 1974 : 272) although some scholars date it as far back as the oldest known deliberate interments of the dead by Neanderthal man, ca. 100,000 years ago, and perhaps hundreds of thousands of years earlier (Furst, 1972 : ix). *Homo sapiens* date from about 40,000 years ago as does the appearance of verbal language. However, anthropologists and ethnologists agree that languages of gestural signs and symbols were undoubtedly employed in religious ritual before that time.

Indeed, zoologists are fond of drawing analogies between human ceremonies and the displays of animal communication, particularly courtship and sexual displays. But Wilson (1975) cautions that human rituals have more than the immediate signal value of animal rituals. In particular, the sacred rituals are most distinctively human and "they not only label but reaffirm and rejuvenate the moral values of the community" (1975:560). While Wilson cites evidence from Paleolithic art suggesting primitive man modeled his rituals from animal behavior, he and others maintain that religious behavior appears to be unique to man among all the animals. La Barre (1970:93), examining the origins of religion, eloquently states this classic position:

It is very doubtful that any wild animal, in need or under duress, ever imperiously commands its environment to change and adapt to the animal's needs. Nor does a wild animal seem ever to beseech the environment to love, take pity on, or care for it—for to do either, in place of adaptive behavior of its own, would swiftly prove anti-adaptive, the environment being what it is. Nevertheless, on occasion, these two attitudes of magic and religion are precisely those that the human animal, in need or under duress, abundantly

manifests. Magic and religion, then, may be only species-specific responses, peculiar to this kind of animal, to which it is somehow conditioned, as somehow apposite behavior that somehow does something for him.

Thus, the motivation to "beseech the environment" and the behavior of superstitious acts become important criteria for establishing religious intent and form. Equally important in defining religious behavior are the concepts of "mysticism," "soul," "magic," among others. The use of such terms for "covert" behaviors depends ultimately on what we are willing to infer from the associated "overt" behaviors.

Thorpe (1974) argues that mysticism is concerned with the awareness of values and elsewhere (Thorpe, 1966) he has shown that animals are capable of such awareness. Indeed, he reviews numerous ethological studies which point to the existence of a variety of "covert" processes in animal species including: ideation and the manipulation of abstract ideas; attention; anticipation and expectancy; self-awareness; aesthetic values; and ethical values. Taken together, these behaviors constitute consciousness which Thorpe finds to be a widespread feature of animal life. Similarly, Savage (1976:127) argues that the functions ascribed to the Cartesian concept of "soul" are present in animal behaviors:

As every animal psychologist knows, apes exhibit the sort of behavior that in human beings is called conscious, rational, reflective, purposive, and voluntary. If the Cartesian replies that only behavior that requires a soul merits these labels, he begs the question. If he continues to insist that apes do not have souls, it can be pointed out to him that since conscious, rational, reflective, purposive, or voluntary behavior in an ape does not require a soul, such behavior in human beings does not require a soul either. Again, the hypothesis of the soul is seen to be unnecessary in explaining human behavior.

The concept of magic or superstitious behavior, according to Skinner (1948, 1953) is also widespread throughout the animal kingdom. Many species exhibit behavior which has no effect on contingencies of reward or punishment but nevertheless become part of behavioral repertoires as a result of purely accidental correlations:

In operant behavior a single instance of a response which is followed by a reinforcing event may be strengthening, and the effect may survive for a long time even though the same consequence never occurs again. Verbal behavior is especially likely to show this sort of 'magic' because of the lack of a mechanical connection between response and reinforcement.

Skinner, 1953 : 351

Similarly, Skinner (1948) demonstrated that pigeons will often behave as if there was a causal relation between its behavior and the presentation of food in a conditioning experiment, although such a relationship is lacking. Skinner's classic demonstration of this phenomenon consisted of giving a pigeon a small amount of food every 15 seconds regardless of what it was doing. When food was first given, the pigeon was behaving in some way, even if only standing still, and conditioning would take place. Thus, the probability increases that the same behavior will be in progress when food is given again. Eventually this given bit of behavior reaches a frequency at which it is reinforced:

It then becomes a permanent part of the repertoire of the bird, even though the food has been given by a clock which is unrelated to the bird's behavior. Conspicuous responses which have been established in this way include turning sharply to one side, hopping from one foot to the other and back,

bowing and scraping, turning around, strutting, and raising the head. The topography of the behavior may continue to drift with further reinforcements, since slight modifications in the form of response may coincide with the receipt of food.

Skinner, 1953: 85

Skinner also stresses that the pigeon is not exceptionally gullible and human behavior is also heavily superstitious. While only a small part of the behavior strengthened by accidental contingencies develops into ritualistic practices or superstitions, the same principle is at work. Skinner goes on to show how superstitious rituals develop in human societies and form the underlying principles of religious control (1953 : 350ff).

While it is clear from the above discussion that the capability for and the components of religious behavior are present in animals, it remains for us to find examples of integrated religious behaviors in the natural habitats of animals.

### Historical and Mythological Accounts

Folklore and mythology are replete with stories of religious animals. The phoenix, an Arabian bird which according to Herodotus flew every 500 years from Arabia to Heliopolis, retained a firm place in ornithological myth from those ancient Egyptian times. According to this legend, upon the death of the parent bird every five centuries, "it brings its parent all the way from Arabia enclosed in a lump of myrrh and buries the body in the temple of the Sun" (in Clair, 1967 : 152).

Religious behavior has been credited to numerous other birds including doves, ravens, and crows (Folkard, 1884). According to a myth surrounding the Church of St. Katherine, where God allegedly revealed himself to Moses in the burning bush, ravens, crows and other birds assembled each year in a pilgrimage to the Church where lamps are kept burning to mark the way. Each "pious" bird "bringethe a Braunche of the Bayes or of Olive, in here bekes, in stede of Offrying, and leven hem there" (in Folkard, 1884 : 142-143).

The satyrs were mythological attendants of Dionysus and were also forest gods associated with fertility rites. They were by nature lustful and earned their name from the Greek word for penis. Satyrs were hybrids of horses and goats and "revered" and "worshipped" Dionysus. In later times, as Clair (1967:84) notes, "myth and monkey became interwoven, and the word was applied to a kind of ape. In modern terminology the orangutan is *Simia satyrus*."

Marco Polo, describing the Unicorns of Sumatra (apparently referring to rhinoceroses) alludes to the animal's "reverence" for and "worship" of virgins. Despite the obvious Freudian symbolism here, a French bestiary written by Philip de Thaun gives a version of this myth:

It is sayd that Unicorns above all other creatures doe reverence Virgines and young Maides, and that many times at the sight of them they grow tame, and come and sleepe beside them, for there is in their nature a certaine savor, wherewithall the Unicornes are allured and delighted; for which occasion the Indian and Ethiopian hunters use this strategem to take the beast.

in Clair, 1967 : 78

In the Elizabethan Age, the pelican was known as the "pious pelican" because of an ancient belief that it fed its young with its own blood ("a Pelican in her piety, vulning herself"). This story was probably based on the pelican's red-tipped beak which might look like a spot of blood when pressed against the white breast feathers, a common component of maternal feeding behavior in pelicans (cf. Clair, 1967 : 133).

The early writers of medieval zoology were much concerned with Christian doctrinal significance and believed that God created animals in such a way as to

illuminate the essentials of Christian dogma. Thus, many legends of birds and beasts were composed of allegories that supported Church doctrine. Pliny wrote that "elephants embrace goodness, honesty, prudence and equity and hold in religious reverence the stars, planets, sun and moon" (in Clair, 1967 : 37). Pliny was probably basing his account on Aelian's *The Nature of Animals* which dates from 2 A.D. and tells that "at the waxing of the moon elephants would gather long branches from the forest trees and in adoration would lift them up in their trunks as homage to the queen of night" (in Clair, 1967 : 42). Pliny provides an interesting account of this behavior:

. . . they [the elephants] have withall religious reverence; not only the starres and planets, but the sunne and moone they also worship, and in very truth writers there be who report thus much of them—theat when the new moone beginneth to appeare fresh and bright, they come downe by whole herds to a certaine river named Amelus in the deserts and forest of Mauritania, where, after that they are washed and solemnly purified by sprinkling and dashing themselves all over with water, and have saluted and adored after their manner their planet, they returne againe unto the woods and chases.

in Clair, 1967 : 42-43

### Ethological Accounts

Not all accounts of religious behavior in animals are folklore and myth. Several observational studies of animals have revealed numerous ritualistic and religious-like behaviors that have thus far escaped biological or psychological explanation.

The death rituals of elephants are perhaps some of the most dramatic, if not religious, behaviors in the entire animal kingdom. As Douglas-Hamilton and Douglas-Hamilton (1975) so vividly describe, not only do elephants show extreme attachment to the sick, dying, and dead, but this attachment extends to decomposing corpses and even elephant bones when they come across them:

[the live herd of elephants] all began their detailed olfactory examinations. Some pieces were rocked gently to and fro with the forefeet. Others were knocked together with a wooden clonk. The tusks excited immediate interest; they were picked up, mouthed, and passed from elephant to elephant. One immature male lifted the heavy pelvis in his trunk and carried it for fifty yards before dropping it. Another stuffed two ribs into its mouth and revolved them slowly as if he were tasting the surface with his tongue. The skull was rolled over by one elephant after another . . . [another elephant] arriving late, pushed to the centre, picked up one of the tusks, twiddled it for a minute or so, then carried it away, with the blunt end in her mouth. The rest of the group now followed, many of them carrying pieces of the skeleton, which were all dropped within about a hundred yards. . . . It was an uncanny sight to see those elephants walking away carrying bones as if in some *necromantic rite*.

Douglas-Hamilton and Douglas-Hamilton, 1975:239

Elephants exhibit equally curious behavior, largely unexplained by ethologists, in their burying behavior. If the deliberate interments of Neanderthal dead are sign-posts of religious ritual in man (cf. Furst, 1972 : ix), than surely one cannot ignore the elaborate burying behavior of elephants as a similar signal of ritualistic, albeit nonverbal, behavior in that species. When encountering dead animals, elephants will often bury them with mud, earth, and leaves. Animals known to have been buried by elephants include rhinos, buffalo, cows, calves, and even human bodies, in addition to elephants themselves (Douglas-Hamilton and Douglas-Hamilton, 1975 : 240ff). Other ethologists have observed elephants burying their dead with large quantities of food, fruit, flowers, and other colorful foliage!



Not only do these large animals display death rituals, but some of the smallest social insects also display conspicuous and stereotyped patterns of "necrophoric" behavior in regard to corpses. Wilson (1971) notes that ants, for example, do not bury their dead in anything approaching a ritualistic fashion, but some, like those of the genus *Atta* carry their dead into deserted nest chambers and galleries. And the *Strumigenys lopotyle* of New Guinea, "piles fragments of corpses of various kinds of insects in a tight ring around the entrance of its nest in the soil of the rain forest floor" (Wilson, 1971: 279). The notion of other "ant cemeteries" has been widely disputed in the literature, and remains today an unknown possibility.

The famed ethologist Eugène Marais describes an equally mysterious and quasi-religious behavior among South African baboons:

With the setting of the sun and the first deepening of the shadows a singular transformation came over the entire scene. Silence fell upon them gradually. The little ones crept cuddlingly into the protecting arms of their mothers. The romping young folk joined different groups, generally on the higher flat rocks from which a view could be had of the western horizon. The older ones assumed attitudes of profound dejection, and for long intervals the silence would be unbroken except for the soft whimpering complaints of the little ones and the consoling gurgling of the mothers. And then from all sides would come the sound of mourning, a sound never uttered otherwise than on occasions of great sorrow—of death or parting. . . . One need only compare them with a native village under the same conditions to realise beyond any shadow of doubt that you have here a representation of the same inherent pain of consciousness at the height of its diurnal rhythm.

Marais, 1969 : 139

A similar behavior has been observed among the *Colobus* monkeys of Madagascar (CBS, 1976). Here, at sunrise and again at sunset, the monkeys climb to the tops of the trees, gaze at the horizon, and sit quietly "as if in prayer."

### Inferential Accounts

A number of writers have speculated on the presence of religious "feelings" in animals, particular in domesticated pets. Lindsay (1879) summarized this opinion in his highly entertaining book *Mind in the lower animals*: "The dog's worship of man in many respects compares favourably with much at least of man's worship of superior beings, real or supposed, animate, inanimate, or spiritual" (1879:221). Lindsay describes various behaviors of dogs which support his inferences including: religious rites similar to the dancing and howling dervish; superstitious behavior as expressed by alarm at stimuli not perceived by man; a transcendent love for its master; self-renunciation amounting frequently to self-sacrifice; power of prayer, petition, entreaty, and appeal to its providence or its master; praying before its master by crawling to its master's feet which is an expression of abjectness and submission to a superior being; seeking of atonement for its sins; among others. Lindsay even speculates that dogs which attend church with their masters frequently display silence, gravity of look, intentness, and probably feelings of awe and wonder! Despite these imperialistic inferential desires, Lindsay is not prepared to label parrots that have learned to recite prayers as anything more than "pious"!

### Drug-Induced Behavior

Do drugs produce religious behaviors in animals? To the extent that the above described behaviors are religious, examples of their occurrence with drug administrations can be found in both field and laboratory environments.

In natural (field) habitats, numerous animals self-administer hallucinogenic plants which have characteristic effects on behavior (see reviews by Siegel,

1973b; Siegel and Jarvik, 1975). Many of these self-administrations are accidental, others are based on folklore or mythology, still others lack the support of controlled studies. Nonetheless, there are some examples of animals intentionally and repeatedly self-administering psychoactive plant substances. Although alcohol is not classified as an hallucinogen, there are a number of reports illustrating the hallucinosis that results from alcoholic ingestion. Both Carrington (1959) and Sikes (1971) review evidence suggesting that African elephants, like man, have a "passion" for alcohol obtained from fermenting *Borassus* palm fruit. The elephants' keen olfactory senses guide them to the ripening fruit which they eagerly ingest. The usually graceful movements of these animals are marked by awkward and inappropriate behaviors after ingestion. This behavior includes staggering, stereotyped trunk movements, and loud vocalizations. In a controlled series of studies (Siegel and Brodie, unpublished data), this behavior was examined in a herd of African elephants in a controlled park environment. Most elephants readily self-administered the alcohol and exhibited the stereotypic ataxia and trunk movements. In addition, most also engaged in behavior reminiscent of the "moon worship" behavior cited earlier. They took large branches and "waved" them rhythmically in the air above their heads or at the sky. The single bull elephant in the herd repeatedly tossed rocks, branches, and even an abandoned tire in the air.

The reindeer of the Asian forest and tundra regions offer another example of quasi-religious behavior induced by drugs. The reindeer and the native Chukchki people ingest *Amanita muscaria* mushrooms which contain the hallucinogens hyoscamine, scopolamine, muscimol, and ibotenic acid. Both reindeer and people manifest "cravings" for the mushrooms and go out of their way to obtain them, the reindeer ignoring their basic diet of lichens. Both animal and man become intoxicated with wild and frenzied behaviors that have greatly influenced the shamanistic practices of the area. Wasson (1968) summarizes observational evidence suggesting that the reindeer are "drunk," "intoxicated," "noisy," and abnormally aggressive. Excitement characterizes these episodes and the reindeer run aimlessly away from the herd and tend to isolate themselves with other intoxicated reindeer. Lewin (1931) describes a similar effect in man: "Some jump about, dance and sing, others cry and are prey to astonishing fright. . ." (1931:127). It has been suggested that for both reindeer and humans, the use of this hallucinogenic fungus is highly stereotyped and ritualistic, if not religious per se.

In laboratory environments, administration of hallucinogens to animals sometimes produces behaviors which are highly similar to those seen in religious activities. Typically, low doses lower spontaneous activity and induce hypersensitivity while higher doses induce more profound sedation. Mice exhibit characteristic "head twitches" and appear hypersensitive to stimulation. Cats appear to lose their aggressiveness toward mice, fondling them instead of attacking them. Dogs often appear frozen in catatonic postures. Monkeys remain quiet, often resting their head on their hands. Chimpanzees appear to show spontaneous expressions of grief and moping or else gestures of intense joy and happiness, behaviors identical to those seen following separation or union with close partners of long standing (Siegel, 1973b; Siegel and Jarvik, 1975; Thorpe, 1966).

In small groups, hallucinogens diminish aggressiveness and fighting behavior in mice and inhibit dominance behavior of rats competing for food. In nearly all cases of hallucinogenic intoxication with populations of fish, birds, and mice, the treated animals tend to avoid social interactions and isolate themselves in small groups apart from untreated animals. For example, Siegel (1971) notes that each time drugged mice were approached by undrugged colony members they would

squeal, squeak, and retreat from the investigation. Drugged mice exhibited typical hallucinogenic patterns of head-twitches, increases in flight postures, and decreases in social postures such as nosing, sniffing, and licking. Furthermore, drugged animals actively avoided investigating mice and escaped to areas occupied only by nonaggressive and quiescent drugged animals. This escape-avoidance pattern of behavior was marked by drugged animals literally hopping over the others or engaging in sham fighting, and behavior resulted in aggregation of drugged individuals among themselves. When entire populations were treated with hallucinogens, inhabitants appeared to actively avoid social groupings by dispersing among themselves. Perhaps the best *Homo sapiens* analog of this animal model is found in the "mushroom madness" of the New Guinea highlands (Siegel, 1973b) resulting from ingestion of hallucinogenic mushrooms. The behavior is marked by shaking, shivering, dancing, delusions, and hallucinations. The men run wildly about, escaping and avoiding others, jumping over obstacles, engaging in sham fighting, until they eventually run away from the group's territory.

Despite the occurrence of quasi-religious behaviors in the above studies, we still do not know if animals will self-administer these drugs in order to produce religious states. Such motivation is important in establishing the human use of these powerful drugs, but little is known about patterns of use among animals. Laboratory studies have suggested that infrahumans do not readily self-administer hallucinogens, although they readily self-administer other types of psychoactive compounds. However, Masserman (1957) has shown that in stress situations cats and monkeys will self-administer alcohol to relieve neurotic symptoms. In the more natural environments, several ethologists, including Marais (1969), have suggested that animals also use various psychoactive compounds to escape from stress, scarcity of food, population density effects, or depression. Indeed, baboons develop cravings for several natural sources of intoxication including poisonous plants: "As to the purpose in the use of all such poisons, I do not think there can be any question: a state of mental exhilaration or happiness is sought by the individual which he does not otherwise possess" (Marais, 1969: 118). A similar motivation may contribute to man's religious use of drugs. Recently, it has been suggested that man may be attempting to relieve psychological stress by the production of ecstatic experiences. Such stress could result from either too much stimulus bombardment or too little. In more cognitive terms, Keniston (1966) refers to the "stimulus flooding" effects of modern Western industrial society and the resultant "psychological numbing" of the individual. Accordingly, the self-administration of hallucinogens provides a means whereby the numbed individual can achieve desired states of arousal and stimulation.

Thus far, we have seen that animals possess behaviors that are similar to religious behaviors in man; that drugs can induce such behaviors in them; and that they possess motivational substrates to alter pain and stress by the use of such drugs. It remains to be seen if animals will become religiously oriented and utilize these motivational and behavioral systems when provided with an experimental opportunity to do so.

#### : THE EXPERIMENTAL ANALYSIS OF DRUG-INDUCED RELIGION

The subject was injected with LSD, a higher dose than given to any man before, and he anxiously entered the dimly illuminated chamber. The chamber was quiet and the air warm and refreshing, as if a soft wind was blowing. A cross was glowing beckoningly on the far wall and the subject approached, genuflected with what was more a one-legged hop than a bend of the knee, and proceeded to touch the cross in the ritualistic, albeit

superstitious, manner. Almost immediately, as if by some unknown magic or celestial bedazzlement, a tray of food appeared and the subject, recognizing the end of his day-long fast, ate eagerly. Suddenly, a bell rang and the subject immediately recognized the warning. Unless the red light was found and touched, an agonizing electric shock would be delivered to his body. Quickly, he left the still plentiful tray of food, genuflected, and touched the cross. Alas! A surprise! The red light appeared next to the cross and he immediately slammed hard against it, causing the light to extinguish. Silence. The bell was silenced and he knew he had cheated the shock, at least this time. Shortly, the LSD started to take hold of his body and senses. Time and space shortened, expanded, intertwined, then changed altogether. Again the bell rang. He raced to the cross, genuflected, and touched it. The red light appeared. He paused for a moment to gaze upon the ruby luster of the signal. How much like a ripen berry it was. The clang of the bell alerted him from his reflections and he slammed hard against the light. The bell and light were extinguished at the same time. Safe again! But too close for comfort. He returned to the security of the cross and remained close to its protective glow. Soon—was it really only ten minutes—the bell rang again. But the LSD peak had arrived, and with it a million lights appeared—red, green, orange, all colors of the spectrum. Which one to hit? Suddenly the shock hit. The room exploded into blackness and he was only aware of his bowels discharging as he fell into unconsciousness.

The above scenario, while only slightly fictionalized, could be viewed as an account of a highly religious subject's reaction to an experiment testing the effects of LSD on the ability to avoid electric shock. The fact that human subjects in LSD studies often manifest similar reactions to experimental demands should temper our initial incredulity and perplexity upon learning that this particular subject was a pigeon.

The original experiment was conducted in an undergraduate psychology class to demonstrate that pigeons can be trained to emit responses functionally equivalent to religious behaviors of man. For these purposes, it was agreed by the class that religious behavior often has the following properties:

1. a symbol associated with the religion
2. superstitious behavior exhibited in association with the symbol
3. associations with positive reinforcement
4. true beliefs associated with the symbol
5. relief from danger and stress
6. association with mystical or psychedelic feelings

In order to condition these behaviors in the pigeon, nicknamed Noah (a friend of animals, he carried out a series of acts on command from God without real understanding), the following procedures were employed. Firstly, Noah was trained in a standard operant conditioning box (Skinner box) to peck a dimly illuminated response key onto which was rear-projected a small cross. Each time Noah pecked the cross five times, he was rewarded with access to a tray of mixed grain for five seconds (positive reinforcement). During the initial shaping of this behavior, Noah exhibited some superstitious behavior consisting of a one-legged hop and bow before pecking the key (genuflection). After several days of training, Noah was introduced to another problem.

In this new situation, Noah was placed in a "shuttlebox," a long alleyway with an electrified grid floor. Each end of the alley had a response key which could be illuminated with either the cross or plain white light. At the start of a trial, the cross would be projected on one end and white light on the other. Noah's task was to approach the side of the alley which contained the cross within 10 seconds or

else receive a brief mild electric shock on the other side. No pecking response was required, but Noah frequently displayed his characteristic superstitious hop and bow and pecked the cross several times. At the completion of a trial, both key lights were darkened for 15 seconds and then illuminated again, but the position of the cross changed randomly from side to side with each trial. Thus, Noah had to follow the cross and shuttle back and forth from side to side in order to avoid the shock, behavior he acquired rapidly with very few errors. Here, in a sense, the animal acquired a true belief in the external symbol (cross) and learned to avoid the incipient shock. The animal's avoidance behavior was true because it was conformable to a standard pattern. It was a belief because the animal's avoidance response was a deliberate habitual readiness to act in a certain manner under appropriate conditions.

In further training, Noah had to peck a red light in the Skinner box in order to avoid electric shock. However, in order to produce this red light, Noah had to first peck the cross in what operant conditioners call an "observing response." This observing response peck on the cross would then produce either a red or green light on an adjacent response key. If the red light appeared (coupled with the ring of a bell), Noah was trained to peck it in order to postpone the delivery of electric shock. If the green light appeared, Noah had no response requirements and no shocks were delivered. In a sense, the observing response produced information as to what schedule would be in effect, and further enhanced the value of the cross as a source of information or guidance.

In order to satisfy the requirement for associations with mystical or psychedelic feelings, Noah was subsequently injected with a high dose of LSD and placed in the box with the cross for several hours.

Subsequently, Noah was given several tests with each problem and varying doses of LSD, including one test described in the fictionalized scenario above. In all such tests, Noah displayed a dramatic propensity to repeatedly remain near the cross, display superstitious hopping and bowing before it, and peck the cross. With low doses of LSD, avoidance behavior was actually improved, but high doses caused the animal to make errors and receive occasional shocks.

While it could be argued that much of Noah's behavior was functionally equivalent to religious behavior in man, it remains possible that the religious feelings so critical to religious experience in man were absent. In order to assess the presence of these states in animals, it is helpful to re-evaluate Pahnke's (1967: 63-64) characteristics of the psychedelic peak or mystical experience in terms of animal behaviors exhibited in drug experiments. Pahnke lists the nine characteristics as: unity; transcendence of space and time; deeply felt positive mood; sense of sacredness; the noetic quality; paradoxicality; alleged ineffability; transiency; and persisting positive changes in attitudes and behavior.

Pahnke defines the unity experience as "a sense of cosmic oneness achieved through positive-ego-transcendence" and notes that consciousness is not lost (true in animals and man) and that the person is very much aware of being part of a dimension much vaster and greater than himself. In animals, there is evidence that LSD produces altering of the visual thresholds in pigeons and a broadening of generalization gradients with auditory stimuli in rats. These findings indicate that the drugged animals are responding to dimensions larger than those established by original training as the normal capability of the animals. In other words, the animals are responding to stimuli along dimensions greater than themselves.

Pahnke's transcendence of time and space "means that the subject feels beyond past, present and future and beyond ordinary three-dimensional space." In several animal experiments, hallucinogens have dramatically impaired time-based schedules of responding. These schedules require animals to inhibit responding for fixed periods of time, but hallucinogens induce massive cortical disinhibition and

responding is no longer restricted to—transcends—the time periods. Space is similarly disrupted. Siegel and Popek (1975) trained rhesus monkeys on a simultaneous discrimination between a “real” M&M candy and an “illusory” M&M presented as a remarkably convincing 3-D projection from parabolic mirrors. The real and illusory candies differed only along a “reality” gradient involving subtle changes in dimensions of hue, saturation, brightness, size, vividness, concreteness, among others. After much training, the monkeys mastered this difficult discrimination and always managed to choose the real candy and not the illusory one. However, when hallucinogens such as LSD were administered the monkeys became confused and their accuracy was impaired. Other psychoactive drugs did not affect accuracy and the authors suggested that hallucinogens impair “reality testing” in animals through attentional shifts from relevant to irrelevant dimensions. Simply stated, the drugged subject’s attention transcends the spatial dimensions of the task. This experiment also illustrates the concept of paradoxicality which Pahnke notes “refers to logical contradictions” whereby opposites appear identical. Such experiences might explain the puzzled expressions of many hallucinogen-treated monkeys as they repeatedly reached for the illusory candy.

Another characteristic listed by Pahnke is a deeply felt positive mood “often accompanied by tears” or other intense and overwhelming emotional responses. In animal studies, hallucinogenic reactions are often marked by intense autonomic reactions, mood changes, and allied phenomena. However, except for the passivity and quiescence which usually follows these behaviors, most experiences appear to excite and frighten the animals. For example, consider the following account of a chimpanzee treated with LSD:

Suddenly he screamed, beat the air before him with his right hand, and defecated. Then he lashed the air before his face with both hands, grimaced, leaped upwards, and screamed. He landed in a sitting position and covered his eyes with his hands. As he sat he continued to salivate and he began to whimper.

Baldwin et al., 1957: 46-47

Pahnke’s sense of sacredness is defined as “a non-rational, intuitive, hushed, palpitant response of awe and wonder in the presence of inspiring realities.” In animal studies, we find many examples where in the presence of shock signals, underwater mazes, and other inspiring realities, animals ignore the signals and remain quiet in the presence of the stimulus signals, even when pain or even survival is at stake. The animal may not be in awe, but the behavior is certainly non-rational.

This sense of sacredness is similar to the “noetic quality,” a characteristic Pahnke borrowed from William James. The noetic quality refers to “a feeling of insight or illumination that is felt on an intuitive, non-rational level and has a tremendous force of certainty and reality.” In many cases of animal hallucinations (see Siegel and Jarvik, 1975) we find instances where animals behave in accordance with the description that they really believe in the non-rational feelings or perceptions they are having. In addition, in the LSD-shock test with Noah, Noah waited too long to avoid quickly and sometimes endured the shock. His behavior was indicative of a false belief: it was no longer conformable to a standard rule established by training. Similarly, the persistent errors made by Noah in the shuttlebox under LSD treatment had no basis in the physical reality of the situation, but Noah behaved as if the trust, confidence, or reliance placed in the cross by training was no longer present. Simply stated, the animal behaved in accordance with the description that he was deluded, acting with “certainty and reality.”

Psychedelic experiences are also marked by "alleged ineffability" which means that the experiences are "impossible to describe," "beyond words," "non-verbal." In man, these experiences are marked by verbal response suppression. Even schizophrenics suppress responding in operant experiments during hallucinatory episodes. Similarly, a characteristic of hallucinogen-treated animals is frequent pauses in operant responding, thereby failing to communicate information on behavior to the experimenter.

These experiences pass into an afterglow and remain as a memory, a characteristic labelled "transiency." There are at least a few state-dependent learning studies with mescaline in rats and marihuana derivatives in pigeons which show that the animals are capable of remembering the drug experience and responding to similar experiences based on patterns established during the original treatment. This, at the very least, shows that animals, as well as man, are capable of storing the memory of such experiences, even when acute effects have disappeared. Such memories can persist in changing subsequent behavior of the animal, much like the persisting positive changes in attitudes and behavior of people.

### Overview

Thus far we have seen that the behavioral ingredients for religious experiences are probably present for hallucinogen-treated animals. However, Pahnke emphasizes that an experience is religious when one is concerned "ultimately," a criteria originally suggested by Tillich in 1951. Others, including Huston Smith, define a religious experience as one which manifests the central core of a person: "Since his being includes feelings, thoughts and will, a religious experience triggers in the experiencer a triple movement—a movement of the emotions in awe, of the mind in belief and of the will in obedience" (in Pahnke, 1967: 69). Since certain drugs trigger or release these experiences, they are known as psychedelic (mind-manifesting) or phanerothyme (soul-manifesting) drugs (Bieberman, 1968).

It could be argued that we have no way of knowing about an animal's experiences and, therefore, we can never know whether an animal is having a true religious experience. But animals might confirm the presence of such feelings by responding to them, pecking at them, waving branches at them, wailing, whimpering, or in some other way behaving as if religious experiences were present. The sheer abundance of the observational studies reporting such phenomena cannot be lightly dismissed. That animals are also capable of manifesting true beliefs in religious symbols has been demonstrated in such studies as the conditioning experiment with Noah. And we have seen that treatment with hallucinogens can dramatically affect these behaviors, often increasing their frequency and intensity.

While God is certainly not in the pill (Meher Baba, 1968), allied religious behaviors are released and strengthened by the use of psychedelic drugs. The behaviors are related to states of central nervous system excitation (Winters and Wallach, 1970) and sympathetic nervous system arousal marked by a behavioral "turning inward toward a mental dimension at the expense of the physical" (Fischer, 1971: 897). Consequently, this excitation and arousal may contribute to the tendency of a variety of social species, including man, to isolate themselves from further stimulation after such stimulus bombardment. In that isolation and estrangement from self and others, the religious psychedelic pilgrim seeks meaning and individuation in his life. That such a search will not be in vain, man can only join one of his counterparts in nature, a certain English Bishop's parrot (Lindsay, 1879: 223) that was in the habit of saying "sometimes quite devoutly and with becoming solemnity, at other times sarcastically or ironically, but in either case at proper seasons and appropriately to the circumstances—'Let us pray'."

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